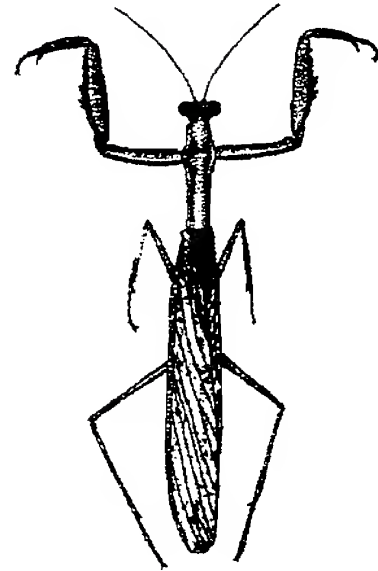


Mantis Study Group Newsletter 9

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Editorial

Please note my new address (above), my telephone number is unchanged. I am still in the process of sorting the cardboard boxes - this is my excuse for the possible late arrival of this newsletter!

Once again there was a very poor turn out for the MSG meeting. Since there were quite a few members at the exhibition, but few at the meeting at the end of the day, I assume that most people decided to go home early. Since there seems to be no desire for a formal meeting of the group we will not bother to arrange one in the future.

"Meetings" will be limited to the informal meetings at the tables of the various exhibitions which we attend. The next big event is the Amateur Entomologists' Society Exhibition at Kempton Park Racecourse on 4th October.

With the number of available species increasing, it is becoming important to check that you know which species you are rearing, especially if you need a mate! There have been several instances of misidentified cultures (and see my note on *Creobroter* in this issue), and several cases of people not knowing what they have. Please try and check your cultures and if you are not sure what you have then send a fresh or preserved specimen to me and I will try to identify it for you. There are also a number of cultures which have not been identified yet, often because they have only recently been cultured; since adults are needed for identification, and it is easier with dead specimens, it can be more than a year before identification can be attempted.

Confusion with *Creobroter pictipennis* & *C. gemmatus* — Phil Bragg.

There are a number of cultures of *Creobroter* which are doing the rounds as "*C. pictipennis*", some of these may be *C. pictipennis* (Wood-Mason) but many are *C. gemmatus* (Stoll). Some time ago I was given nymphs of "*C. pictipennis*" and an ootheca of "*C. gemmatus*". When both lots became adult I realised that something was wrong: they were identical! Giglio-Tos's key to the genus indicates that *pictipennis* has green hindwings, all mine had red hindwings. I have since decided that they are *C. gemmatus*, although at present I have only examined the males since all my females are still alive. I should perhaps add that since I have not examined the females and Giglio-Tos' key requires the females, I am at present by no means sure that those I have are *gemmatus* (for example, the colour of the hindwing veins of the female is used to distinguish *C. meleagris* from the others with red hindwings - there is no mention of the veins of the male).

A shocking experience — William Mills.

In the evening of 5th August I had a shocking experience. Earlier in the day I had watched a female *Creobroter meleagris* while she laid an ootheca, at the beginning of laying she started to make pulsing movements with her abdomen. At about 2240 I was watching her trying to catch a medium sized cricket, she had missed the cricket twice. Just after she missed the cricket for the second time she started to make pulsing movements with her abdomen again so I thought that she was going to lay another ootheca. I watched to see where she was going to lay it. She then moved a little to the left and then, all of a sudden, a couple of drops of clear fluid came shooting out of her abdomen. Then I looked around the cage to see if she had done this before: near the top I saw a couple of dried droplets which were a light blue in colour.

This particular female has not been mated and has so far laid two oothecae. Just before she laid the first I found some dry powdery droplets. I wondered whether the clear droplets would dry into powdery droplets so I left them and went to bed. The next day I looked in the cage to see what had happened and saw that she had done it again, right next to the original ones. The originals had dried to a light blue colour with small powdery deposits at the bottom. Has anyone had the same experience, or do they know why they do this, or what it is? If so, could they please write a reply for the next *Newsletter*.

Mantispotting - or the Praying Mantis Season 1997 in New Jersey, USA.

— Andy Lasebny.

[Editor's note: The following is the second part of a diary of mantis events made by Andy Lasebny in 1997 (the first part was in *MSG Newsletter* 8). It was recorded as the events happened, and is presented here with only very minor editorial changes: mainly conversions to metric units and English spellings.]

Part 2. - September onwards.

September 1st - The *Tenodera aridifolia sinensis* nymph I found on the store window on August 4th, just had it's last moult - it's a male. Good - I will make good use of his services. The other two still only eat one small cricket each morning, but at least they do eat consistently. The new green female is much more aggressive, and pursues anything I put into her cage.

September 3rd - It's a sunny, windy afternoon, not as hot as it has been. I go to the bank on main street, a five minute walk from the office. Afterwards, I cross the street to walk back along the other side. I look at a store window and spot a brown male *Mantis religiosa*, high up, just out of reach. I jump up to try to at least get him to move, and he takes off. He flies around in circles, along the sidewalk at about eye level, almost flies into the face of a group of people walking by, circles half way into the street, and finally comes back and lands on the sidewalk a few metres away from me. I pick him up and take him to the car. I get into the car and drive to a shopping centre located out of town on the highway, about a mile away. I park the car, and as I walk toward the door of the store I want to go into, I see a green male *Mantis religiosa* on the side of the stucco wall right by the door. I take him and put him into the car. Afterwards I walk along the path under the canopy to go to another store, and spot another green male perched on one of the concrete columns. Finally - enough males to go around! I take him as well and head back to the office. Later that evening, closer to home, I go to a shopping centre and see a dead female *Mantis*

religiosa on the sidewalk near the door - looks like someone stepped on it.

September 4th - I find a green female *Mantis religiosa* on a brick wall in the entry to a gift shop. Might as well take this one too - maybe I will just release her in my garden.

September 6th - early morning, we are going to Florida for four days, Sanibel and Captiva islands on the gulf coast, near Fort Meyers. Maybe I will find some interesting creatures. The first day I see mostly numerous lizards - anoles I guess. At night, there are various gecko species and some tree frogs climbing the walls of the hotel. Each night the large Cuban tree frogs come to the same spot near the lights to catch insects. There are no mantids anywhere in sight, just an occasional cone headed katydid. On September 8, I go to the J.N. 'Ding' darling wildlife refuge, which takes up about a third of the island. Along the path I see many unusual birds, such as ibises, herons, cranes, and pelicans. By far the most numerous insects are large dragonflies, but no sign of any mantids. There are a lot of large orb weaver spiders though. In the tidal areas I can see fiddler crabs going in and out of their holes in the sand. I drive out of the refuge and head over to an area called Bowman's beach. This area contains completely different vegetation than the other area. This is a pine forest with all sorts of strange vegetation underneath, including cactuses. Just before entering the area, I spot something walking across the hot black road surface - a large bright yellow and orange grasshopper. I stopped the car and get out for a closer look. It's a lubber grasshopper, the largest in the US. I picked it up and put it in a bag in the car. Looks like this would be interesting to keep. After a going for a swim, I take a walk on the trail. On one of the shrubs I spot three mantis egg cases. Long and narrow, probably from some *Stagmomantis* species. Unfortunately, these appear to have already hatched earlier in the year, since there seem to be rows of holes along the front of the cases. I take them anyway, just in case. I keep looking, and there are no mantids visible. A few minutes later I spot a pair of mating phasmids - they are dark in colour with light stripes running lengthwise along the body. The female is fairly broad, and about 7.5cm long. The male is very tiny and slender. They were perched about a foot off the ground on some grasses in a sunny clearing in the forest. I wonder what their foodplant is, since there is no bramble anywhere to be found. I left these alone, since I heard this species sprays an irritating fluid. After getting back to the hotel, we go out to eat. This is our last night here, and I take one last look around the hotel later that night at around 2200. As I walk around under the lighted canopy I see the usual geckos and tree frogs. Then suddenly I spot something long and brown on the ground by one of the rooms - it's a mantis, finally. I pick it up and bring it into our room for a better look. It's a male, long and very slender, greyish brown mottled, with a vertical stripe pattern on the front legs. The wings are more cylindrical around the abdomen rather than flattened as usual. This must be either *Stagmomantis carolina* or *Stagmomantis floridensis*. I go back out to look for a female, with no luck. So I pack him up and take him home.

September 9th - I arrive back home with the creatures that afternoon and place them into suitable cages. The grasshopper eats some lettuce. The two female *Mantis religiosa* that have mated both made egg cases, and attached them to the lids of their containers. The *Tenodera aridifolia sinensis* female that was eating poorly seems to be better - she now strikes at the cricket quickly and ate three this time. Now I have 16 mantids.

September 10th - This evening I attempt to mate another *Mantis religiosa* pair. I tried using the tiny male that did not want to mate with the others, and he was hesitant again. He is just too cautious and seems afraid to approach the female. I put him away and try another male, one of the new ones I found. After a few false starts and some flying around the

room, he finally gets on the female's back. She looks over her shoulder at him and raises her wings. I immediately give her a cricket, which causes her to calm down, and the mating proceeds normally. The following morning the male is far from the female on the wall, all in one piece. This method of feeding the female during mating seems to be working, - leaving them out of their cages in the room gives the male a chance to escape.

September 11th - I'm driving home, it's about 2030 and getting dark. As I slow down to stop at a traffic light about ten minutes from home, I see a large mantis slowly flying along the opposite side of the highway. I hope it made it to the safety of some vegetation. Later that night I attempt to mate another pair of *Mantis religiosa*. Take one of the brown females and try to use that tiny male again. He is, as usual, hesitant. Since nothing happens after a half an hour, I take out another green male, one I did not use before. Maybe the other one can watch and learn by example? I place this one behind the female near the other male. After coaxing the female to move around and walk a bit, the new male notices her and begins his approach. I have to continually get the female to move, because he does not seem to respond to her if she is not moving. He finally leaps on her back after about 15 minutes. He lands the wrong way, then turns around. The female raises her wings, but soon calms down, and I hand her a cricket. The following morning she is still on the same branch and the male is on the window, far from the female.

September 13th - It's time for another mating. I take out the dark brown female *Mantis religiosa* I found in back of the pharmacy and try to get the one brown male to mate with her. She behaves and moves differently than the other females - she either stays still on the branch, or runs up. There is no in between. The male seems to slow to react, and she soon runs out of his sight range. Every time I put her back near him, she does the same thing. When she is still, he does not notice her. I coax her to move, and she runs up the branch. Before the male has a chance to approach her. After a half hour of this, I give up and put a different male near her - the one who already mated with two other females. He shows far more enthusiasm for this than the others do. Sure enough, after a few minutes, he ran after her and the mating was successful.

Sunday, September 14th - It's a very warm and sunny day. At about 1100 I take a walk to the other side of town, where I saw a lot of mantids last year. A block from my house I see two *Tenodera aridifolia sinensis* nymphs on some shrubs, the same place I saw them on August 30th. I wonder why they are still so small - did they not get enough food? I continue the walk and see nothing along the way until I reach the edge of town by a landscaped area near the entrance to the town's main street. There, on a small planting of perennials I spot an adult green female *Tenodera aridifolia sinensis*. A few centimetres away is a brown male. Near them is an identical pair already mating. As I walk away from there, along a very long, dense row of privet hedges, I spot six more males right on top of the hedge. One of them is a rather uncommon colour variation found only in the males of this species - brown, green, and orange. Each male seems to be spaced approximately equally from the other - I wonder if they have territories. Also on top of this hedge I see two females, one green and one brown. I go over to a nearby large wooden sign that has flowering perennials under it, and see two more brown males and a green nymph, probably a female. I walk back to the house, and get ready to go to the beach. I pass by a house across the street and see a brown nymph and two green nymphs in the garden. These are probably some of the same ones I saw a few weeks ago in the same area. That same evening, I decide to have the two *Tenodera aridifolia sinensis* that I raised from hatchlings mate. I feed both of them, (they are now eating very well), and then place them both on a tall cork bark log that I have in the room. In less than ten minutes, the male runs up to the

female and they mate. The following morning, the male is safely perched on top of another mantis's cage, and the female is on the curtains next to the cork bark.

September 17th - during lunch I drive to a garden centre about 15 minutes away, to look for some plants. I notice three *Tenodera aridifolia sinensis* on a wooden fence - a green nymph about to moult, a brown female, and a brown/green/orange male. On the way out, I see that the male has flown close to the female and is looking at her. Later in the evening, I get home and find that another mantis *religiosa* has made an egg case.

September 19 - I attempt to do another mating, the last *Mantis religiosa* female, the largest one. The males all seem too small. I choose the one that seems to be the largest, the only brown one. Unfortunately, as soon as I take him out of his container, he appears to be so excited about being out, that he ignores the female and just flies around the room. Every time I put him back near the female, he takes off. I give up, and choose another male. This one notices the female, and approaches very carefully. After several attempts with the female getting out of range, I put the female near him again and he goes after her, and leaps on her back. Unfortunately, at that moment, the female turns around and opens her wings. He winds up partially under her wings and can't position himself properly. She keeps trying to grab him, and I keep interfering. She calms down and tries to put her wings down, but he is under the wings. After a long time, he still cannot seem to position himself properly, and he does not appear to be able to reach the end of her abdomen - she is too long. She starts to walk up the branch and turns around to look at him. He quickly drops to the ground and runs away. I finally try the one male who seems most reliable and has mated with three other females. He does his usual thing and gets on her back, but she opens her wings again and he lands on her facing the wrong way, as he has done consistently. This time, however, he can't figure out how to turn around because he is tangled up under her wings. She keeps trying to reach around and get him off. He keeps trying to turn around, but her wings are in the way. But she cannot put her wings down because he is partially under them. This goes on for a long time, until she grabs him and I quickly intervene. He jumps off and flies down to the ground. After a few minutes, I try putting them together again, and he does it right. However, he appears to be too short - he can't reach the end of her abdomen. They stay together and I leave them alone overnight.

September 20th - In the morning the pair are in a different location, the male still on top of her, but I do not know if any mating has taken place. I hand her a cricket, and the male immediately takes off. After she finishes, I put both of them back in their containers. I go for a walk and spot a few *Tenodera aridifolia sinensis* along the way - a brown adult female in a vine covered front yard, a green nymph on a shrub, and two of the green females I saw the previous week on the landscaped area by the town entrance. One was eating a large bumble bee. A male was nearby. On the other side of town, close to the beach, I see a green female on a tall shrub. The following day I see a brown male across the street from my house on a shrub, and a brown female on the same black column that I saw a green one on two weeks ago, in the same position.

September 23th - Green female *Tenodera aridifolia sinensis* spotted on an evergreen shrub across the street from the office.

September 26th - Dark brown female *Mantis religiosa* makes an egg case.

September 27th - Another green female *T. aridifolia sinensis* spotted in a garden in my town.

September 28th - Time to mate another pair - the large green female *Tenodera aridifolia sinensis* I found last month and the male that was the nymph on the store window.

I place the male on the cork bark log. I take out the female after feeding her and place her near him. She immediately runs up the log to the top. I put her back down, and she runs back up. The sees her run up this time, but she is out of range. I put her back near him, and she begins climb slowly. He notices her, and in about a minute leaps onto her back but lands sideways. She gets startled and he flies off to the top of the log, and looks at her as she begins to climb up. When she gets near him, he raises his abdomen out from under his wings several times to signal her. He then leaps onto her back and she stretches out her front legs while he adjusts himself. The mating is successful, and the following morning they are fine. I was initially concerned about this female being more likely to eat the male, since she is the most aggressive mantis I have, and also the quickest in capturing prey. On more than one occasion she managed to catch a cricket I was dropping into the cage in mid-air before it hit the ground - with a distance of only about 20cm from the lid of the cage and the floor of the cage.

September 30th - On the way back into the office after lunch, I see a male *Tenodera aridifolia sinensis* lying dead on the ground close to the door - someone apparently stepped on it.

October 1st - Green female *Mantis religiosa*, the first one I found on July 29, finally made an egg case.

October 4th - The first two *Mantis religiosa* to make egg cases each made another one.

October 5th - A hot and sunny day, there should be plenty of mantids out now. During the late morning hours I see a green female *Tenodera aridifolia sinensis* on top of a shrub across the street from my house. This is probably the same one I saw on the nearby steel column a few weeks ago. Across the street from there, I notice a brown male on the sidewalk near the curb - I immediately pick him up and place him near the female, before someone steps on him. A few houses down, closer to the beach, I see a greyish brown female *Mantis religiosa* on the concrete foundation wall. This is the first one of this species I have ever seen in my town. Since there is no shelter anywhere near there, I relocate her to some dense plants near the beach. Later on, I walk to the other side of town, and along the way see a male *Tenodera aridifolia sinensis* on a honeysuckle vine, two brown females, another male, and a very large green female, most of these on dense privet hedges. Later that evening, one of the brown female *Mantis religiosa* dies unexpectedly. I noticed that she did not want to eat for the last three or four days; she just hung from the lid of the cage and refused all food. This was a mantis that used to vigorously chase after crickets all over and did not even wait for them to get closer. She made one egg case, and was half way to another. I have no idea what the problem was. The same night I catch my brown female *Tenodera aridifolia sinensis* in the act of making her egg case. She was toward the end of this process, and I could see her quickly moving her abdomen around as she made the foam. The posture was also interesting - she hung head down from the twig and tightly held on to the twig not with the tarsus of the front legs, but gripped the twig with the spikes of the front legs the same way as she would use them to hold prey. This is the first mantis to actually use the twigs I provided. All others simply made the egg cases on the walls or lids of the containers.

October 6th - In the evening, I go to feed the mantids and notice that the very largest *Mantis religiosa* has made an egg case, though this may not be fertile since I could not tell if a mating had taken place. The grasshopper I found in Florida has just died, but not before laying eggs in the potting soil I provided in the bottom of the tank. This was the natural end of it's lifespan anyway, and since I assume that Florida is about two months ahead of New

Jersey with regards to the time that such insects hatch, the *Stagmomantis* species probably is also nearing the end of his lifespan. I see that on this evening he is having trouble capturing a cricket. Normally I feed him a cricket that I tie to a thread to make sure he catches it, but this time repeated strikes are not effective, as the grasping forelegs keep re-opening after the strike, and the cricket falls out. It almost seems as if the mantis is losing control of the forelegs and cannot hold onto the cricket. He is still capable of flying, though, and appears to be otherwise healthy. I still do not know which of the two *Stagmomantis* species he is, but since he is 7.5cm long, I think he may be *S. floridensis*, since *S. carolina* is supposed to be smaller.

October 7th - The large green female *Tenodera aridifolia sinensis* has made her first egg case, on the wall of the cage. Now that she is light again and can fly, she does that right after I take her out of the cage. This one likes to fly more than most females do.

October 10th - Dark brown female *Mantis religiosa* makes her second egg case.

October 12th - I saw the same green female *Tenodera aridifolia sinensis* across the street from my house that I've seen before, in the same spot on the black column. She probably goes up there every day for a few hours, but I only see her on the weekends since I am not home at that time during the week.

October 14th - I saw a brown female *Tenodera aridifolia sinensis* on an evergreen shrub in a park during lunch. Later that evening, there was a male of the same species on a fence near a garden close to my house, probably one that I saw before in the same area. This has been the most consistently warm, even hot, October, so the mantids are still quite active, even though the major activity period is now over.

October 17th - One of the brown female *Mantis religiosa* has made her third egg case.

October 24th - Brown female *Tenodera aridifolia sinensis* starts her second egg case. About 2300, I see her upside down on the screen mesh side of the cage, moving her abdomen round and round, as if searching for a spot to begin. Soon after the froth began to come out, and I could see the egg case slowly begin to take shape. One of the green female *Mantis religiosa* is not doing too well. She has a hard time holding on to the twigs in the cage. A few times I found her lying on her back on the ground. I thought she was dead, but when I picked her up, she was alive, but unable to right herself. I had to place her in a twig, which she began climbing using the spiked portion of the forelegs instead of the tarsus. She still eats though, if placed in a comfortable position where her front legs are free to grasp the cricket. I noticed another strange problem - a portion of one of her foreleg's coxa looks as if it is deteriorating - it started as a small hole and seems to be getting larger. It appears as a brown or black eroded area, but the foreleg appears to be functioning properly, just slower. The other ones vary in their overall health. Some are as aggressive as ever, and actively pursue their prey, others have slowed down and will only eat if I hand feed them a cricket tied to a thread. The male *Tenodera aridifolia sinensis* I raised from a hatchling is showing signs of age. He does not eat every day, moves with less agility, and drinks a lot of water. All of them drank very little water when they were younger; now some of them want water almost every day. Outside, the temperature has dropped considerably. Though there has not been a major frost yet, (except for some spots in northern New Jersey), the leaves on various vegetation are thinning out, and the days are getting shorter. This means less places to hide, and less food available. During August and September mantids were able to find food day and night. Now there are only a few hours during the day that insects are active enough in enough quantities so that a mantis can get a meal. There are less and less mantids now, as accidents, lack of food, and predation by birds have taken their toll.

October 27th - During lunch, I see a green female *Mantis religiosa* on the ground by the entrance to the office. The wings are spread out, and I can see that this mantis is injured. I pick it up and see that there is damage to the mesothorax. Either the mantis was flying and was hit by a car driving through the parking lot, or a bird crushed it with its beak, and the mantis fought back, causing the bird to drop it. Since there is nothing I could do, I leave it alone. The heavy winds and rain from the storm of the previous night may have blown the mantis into that area. This is the same place that three other mantids wandered into and got stepped on. The very first female I found on July 29th was just centimetres from the ground and would probably have walked on the ground and been crushed had I not found it. Later that evening, I find another egg case made by that mantis, the second one. Also, the male mantis *religiosa* that did all the mating with three females died suddenly. He seemed fine up to the end. I wonder what happened? The other males seem to be fine too, but who knows? It's getting harder to get them to eat now.

October 29th - The brown female *Tenodera aridifolia sinensis* that has just made her second egg case five days earlier, has weakened suddenly and refused all food for the past two days. A long drink of water was the last thing she had, and just sits there, motionless, and does not react to much stimuli. The abdomen appears to be swollen on one side along one of the segments, and the soft parts along the side are rather discoloured. It's as if making that last egg case caused some damage or obstruction in the abdomen.

October 31th - The mantis is dead, but there are two more egg cases, the third egg case from the dark brown female *Mantis religiosa*, and one from the largest green one, her second; (probably not fertile).

November 3rd - The large green *Mantis religiosa*, which was in great shape, suddenly appears to be losing its health. She is behaving strangely; keeps trying to get out of the cage. When I take her out, she is only interested in climbing and wandering about, and ignores all food. This mantis always ate very well, and was very alert, and now seems disoriented and confused. The male *Tenodera aridifolia sinensis* which I raised from a hatchling, is also rapidly deteriorating. There is a black area on the prothorax where the forelegs are attached, and this black area seems to be spreading to one of the forelegs. He has a hard time striking accurately at his food, and is not eating much. Another curious thing has also happened to this mantis - one of his back legs has fallen off - first most of the tibia, right close to where it joins the femur, then a few days later, the entire femur has fallen off. What is really strange about this is that this mantis had the same thing happen when it was a nymph - after the third moult, that leg did not come out well, and both the tibia and femur had fallen off after a few days in exactly the same way as it did now. The leg regenerated by the time the mantis became an adult, and was fine until a few days ago. I wonder what is going on here? The *Stagmomantis* male is still around, has good days and bad days. the tarsi on each leg seem to be drying out and getting brittle - some have fallen off, others have lost their stickiness. As a result of this, he has a hard time holding on to the twigs, and wraps the four rear legs around them. But since the forelegs are still functioning reasonably well, he can still eat a small cricket, but only if it is tied to a thread and held in front of him in just the right way. One some days, he hesitates to strike at all, and eats only every other day. These all seem to be normal symptoms of age - he most likely is the oldest of all these mantids. However, the problems some of the others are having appear to be different, and these are not as old yet. If this sort of thing is happening to the mantids outside in the wild, then that certainly explains why there are so few left by now, even though the weather is still reasonably warm during the day. They could never catch any food if they are not in perfect health, and only those that managed to stay perfectly alert and healthy still remain outside.

Some of the captives are as quick and alert as they were when I first found them, such as the green female *Tenodera aridifolia sinensis* and two of the female *Mantis religiosa*. The males are not doing as well, and do not seem to have enough of an attention span to concentrate on catching a cricket that is moving around the cage, unless they are very hungry, and they do not want to be hand fed like the others. The only way to get them to eat is to put them into very small containers where they can reach the cricket from anywhere inside it.

November 5th - The male *Tenodera aridifolia sinensis* whose prothorax was turning black, is dead, hanging by one foreleg in the cage. When I take him out, I notice that the body is very limp and feels like it's falling apart. Usually a dead insect is fairly rigid and holds together. This one bends completely in half where the prothorax joins the mesothorax. That area has actually separated and is soft and rather liquid there. It is as if the insides of the mantis all became too soft, and even the forelegs do not appear to be attached very well to the prothorax. I have seen something like this happen to another male of the same species in a garden I had a few years ago. He just stopped moving for several days, and just died right on the plant, still attached to it. When I removed him from the plant, his body was also very limp and seemed to be falling apart at the joints.

November 11th - The *Stagmomantis* had a strange thing happen - a part of his foreleg, most of the tibia, is missing. I do not know what happened, but I still managed to get him to eat - he caught a small cricket tied to a string with just one foreleg after several attempts. The tarsi have all fallen off, but he still is lingering on. He also drinks a lot of water each day. The largest female *Mantis religiosa* who has ignored all food for a long time, suddenly decides to start eating again, after more than a week of not eating. This evening she quickly caught and ate a full size cricket, as if nothing was wrong before. I tried several times each day before this to get her to eat, with no luck. The other green female, with the deteriorating foreleg, is doing very poorly, has not eaten for several days, and moves very little. She has only a day or two left, and could have made a 3rd egg case, but evidently does not have the strength left to do so.

November 12th - That mantis is now dead.

November 13th - The largest green *Mantis religiosa* is now dead as well. That cricket two days ago was her last meal.

November 16th - There was a storm the night before, and temperatures got very cold. The coastal areas just had a cold rain, but inland there was some ice and snow. This morning, the sun is out, but it's no more than 40 degrees fahrenheit. At noon, I take a walk to the store, and walk two extra blocks further away and closer to the beach on the way back. I pass by a garden in which I have seen mantids before. I take a look on a tall, dense shrub in that garden that is right near the sidewalk, and spot a green female *Tenodera aridifolia sinensis*, facing south and trying very hard to warm up. This is the latest day in November that I have ever seen a live mantis in the wild. This may be the same female I saw on October 5th on this same plant. I pick her up and she feels cold to the touch, and can only move very slowly. I decide to take her home, since the weather for the coming week supposed to be near or below freezing at night. In the house, she warms up in less than ten minutes, and seems alert and in very good condition. I give her a cricket, which she eats quickly. I should be able to get an egg case out of her soon. I'm sure that she made at least one in that garden. While 99% of all mantids in New Jersey are probably dead by this time, there obviously are a few lucky survivors, those that not only managed to remain in near perfect health, but were also lucky enough to be in the right location. The ones near the coast are most likely to have survived, and they must also be on vegetation that is dense

enough not only to provide cover, but enough to allow the mantis to remain on it even when the nights get so cold that it cannot hold onto the twigs. As long as the mantis can remain on the vegetation, the sun will warm it up the next day and it can recover and find food. If the plants are not dense enough, the mantis can easily fall off the plant onto the ground during a cold night, risking being eaten by a passing hungry rodent. This plant that the mantis was on had the added benefit of being a very long blooming semi-evergreen, so on sunny afternoons bees and wasps come to this plant, greatly increasing the mantis' chance of getting a meal at least a few times a week. If all these elements do not come together at once, a mantis cannot survive this long in the wild in this part of the country. The leaves on most deciduous trees and shrubs have now fallen off, and even sunny meadows are now thinned out and sparse looking, with only a few plants that still have flowers.

Back inside, the other green female of this species is restless and keeps trying to get out of the cage. I take her out and let her climb on the house plants. She spends the next half hour climbing very quickly all over the room, on the plants, curtains, and walls, going up the whole time, and looking up at the ceiling and trying to reach up toward something. Since she is very heavy and has been rather overdue in making a second egg case, I put her into a cage before she falls and injures herself. I use a different, taller cage in which I have some thick, sturdy twigs. She calms down after a while, and within the next two hours begins making an egg case on one of the twigs. It seems that she did not think the other cage had enough height or suitable places to lay eggs. Though her first egg case was made in that cage, she attached it to the clear plastic wall, not to the twigs I provided.

November 17th - The *Stagmomantis* from Florida is dead.

November 19th - Two of the female *Mantis religiosa*, the brown one and the green one I found in July, attempted to make egg cases, but something appears to be wrong, since only a small amount of froth was deposited on a twig with no eggs laid by the brown female, and a very small egg case was made by the green female, which probably has a few eggs in it. The brown one is very plump and should be able to make an egg case - this would be her fourth. She still eats a moderate amount of food, though she is slowing down and is not as healthy as she was. The green one has not eaten for almost a week. When I give her a cricket tied to thread, she takes a very long time to react to it and when striking either misses or lets go right after grabbing it. Sometimes she takes a bite or two and then drops it.

November 20th - The dark brown *Mantis religiosa* female made her fourth egg case.

November 22nd - One of the green male *Mantis religiosa* dies suddenly with no prior warning. He ate a cricket in the morning, and was lying on the bottom of the container in the evening. He showed no signs of slowing down, and went after the crickets vigorously each day. The last of the two male *Tenodera aridifolia sinensis* is now slowing down and no longer can catch a cricket. Even if I tie a cricket to a thread, he cannot grasp it. His forelegs strike out in a slow, feeble manner and open again immediately, so he never actually can hold onto it, even after repeated strikes. It is as if he has lost all coordination and control of his forelegs. This male has been free-range in the room since he mated with the large green female. I just never put him back into a cage, and he went wherever he wanted to. Mostly he had a favourite spot up near the ceiling on the chains that a light fixture is suspended from. Sometimes he went into the plants, or was on the curtains, but always returned to that spot.

November 25th - The male is dead. Outside it has been cold, with frosty nights. Temperatures are going down to around -5°C at night. Praying mantis season 1997 is really over now. All that remain are the eight captives.

December 5th - One of the brown female *Mantis religiosa* dies after a long period of

not being able to make an egg case. This one made three, and seemed ready to make a fourth, but could not for some reason. She kept eating and getting heavier, to the point where it seemed like the abdomen could not expand any more.

December 6th - The last green female *Mantis religiosa*, the first one I found this year, finally dies after that long period of eating poorly, or not eating at all. The behaviour as the November 19th description says, continued throughout the last three weeks, with the mantis only taking a few bites of a cricket and then dropping it, and then continuing to eat it if I gave it back, but only for a few more bites at a time. Neither one of these two females drank much water throughout their lives, unlike some of the others. *Tenodera aridifolia sinensis* seem to drink far more water as they get older more consistently. Only a few of the *Mantis religiosa* drank water with any consistency.

December 10th - The brown male *Mantis religiosa* dies without any warning, just like all the rest of the males of this species did. He appeared to be in perfect health until the very end, eating one small cricket each day, and going after it in his small container. His accuracy and reflexes remained good until the end, unlike most of the others, which gradually deteriorated.

December 16th - Another male *Mantis religiosa* dies, exactly as above. He seemed alert and in good shape until the very end. There is only one male left.

December 20th - The last male *Mantis religiosa* dies, exactly as above again. The remaining female is not doing too well - she started showing signs of deterioration a few days ago, as she only ate part of her meal. Now she just grabs the cricket and lets go right after, without taking a bite. Giving the cricket back to her produces the same results. This mantis cannot last more than a few more days. The two *Tenodera aridifolia sinensis* females are still eating well, but the 'new' one, found on November 16th, appears to have a clear, gel-like substance clogging the abdominal opening, and I do not think she can make an egg case, even though she is heavy and appears ready. The other one, found on August 25, is still in good shape, but is overdue for an egg case as well. This one will probably win the longevity race. Neither seems very interested in drinking much water, which would maybe help them, though they did on occasion drink a lot of water in the past, but not with the consistency I usually see in this species.

December 23rd - Both of the females made rather small egg cases, sometime during the day, since they were not there yet in the morning. It's the third one for one of them, and the other one, of course, made an egg case or two somewhere in that garden, so this may be the second or third. This mantis now seems to be weakening, and there is a small drop of black liquid coming out of her abdomen.

January 2nd 1998 - Here it is, the new year, and two have survived. The green female *Tenodera aridifolia sinensis* I found on November 16th is dead. The black substance at the tip of the abdomen kept coming out during the past week, and hardened, clogging the abdominal opening. The mantis ate less and less, and began to get weaker each day. By the first day of January, she was lying on the floor of the cage, barely moving. However, she had a good six week longer life than she would have had if she had been left outside. The other green female is doing fine, and that dark brown female *Mantis religiosa* is still around, but eats only ever few days. On other days she grabs the cricket, takes a bite, then drops it. On every third day or so she eats the whole thing. I'm surprised she has lasted this long.

January 10th - The last *Mantis religiosa* is now dead, after getting weaker each day and barely moving on the last day.

February 23rd - The very last mantis is now dead. The green female *Tenodera*

aridifolia sinensis was an adult for six months. During January and most of February, she remained in surprisingly good health and ate well until the middle of the month. She had far fewer signs of aging than most of the others. Though the tarsi had started to weaken and break at the joint, they never actually fell off. The wings remained neat and perfect until the end. The mantis just gradually got weaker, moved less, and finally stopped eating about three or four days before. She would grab a cricket, take a bite or two, then drop it. She never got to make a fourth egg case, and the bottom of the abdomen has a reddish, discoloured area.

CONCLUSION

After all this, how does "praying mantis season 1997" compare with other years? This particular year was not exactly a "typical" year for mantids - there was an above average number of *Mantis religiosa* and a below average number of *Tenodera aridifolia sinensis*. Usually, I find the larger species in greater numbers and in more different places than I did in 1997. However, it was a year in which I found the earliest adult *Mantis religiosa*, (July 29th), and the latest *Tenodera aridifolia sinensis* to be still alive in the wild, (November 16th). This made it the longest mantis season I ever saw, especially if I include the very long lived captive mantis. There were also a greater number of green females of the larger species spotted in the wild than usual. In most years, the brown females outnumber the green ones. The opposite seems true for the smaller of the two species.

Mantis abstracts

The following are abstracts from papers published recently, or in some cases details of the paper but without an abstract. The papers are in English unless otherwise indicated. The editor would be grateful for copies of any recently published papers so that abstracts may be included in this section of the newsletters.

Frantsevich, L. (1998) The coxal articulation of the insect striking leg: A comparative study. *Journal of Morphology*, **236**(2): 127-138.

The thoraco-coxal muscles and the geometry of the leg suspension inside the prothorax were investigated in a praying mantis *Mantis religiosa*, an aquatic bug *Ranatra linearis*, and a neuropterid *Mantispa lobata*. Comparative observations were carried out on a cockroach *Nauphoeta cinerea*, a pentatomid bug *Graphosoma italicum* and a neuropterid *Creoleon plumbeus*. Adaptation of the thoraco-coxal joint to striking function was attained by different morphological structures, preadapted specifically in each insect order with respect to the articulation of the coxa, the number of muscles and the development of the endoskeleton. Adaptation provides for two main properties: maximal distance of the strike and the required rigidity of the supporting structures. In turn, these goals have given rise to some secondary problems, e.g., the versatility of the thoraco-coxal joint and the supposed coactivation of different muscle groups during the strike.

Klass, K.D. (1998) The ovipositor of Dictyoptera (Insecta): Homology and ground-plan of the main elements. *Zoologischer Anzeiger*, **236**(2-3): 69-101.

The ovipositor morphology of Mastotermes and some Blattaria and Mantodea is reinvestigated. Homology relations within Dictyoptera and between these and other Ectognathan taxa (Archaeognatha, Zygentoma, Notoptera, Ensifera) are discussed. The sternal or coxal origin of Dictyopteran ovipositor elements is analysed - based on the interpretation of the basal Ectognathan morphology according to Scudder (1961a, b, 1971), Bitsch (1973, 1974), and Rousset (1973). Outgroup comparisons with other Ectognatha are used to polarise problematic characters within Dictyoptera and to reconstruct the ground-plan of the order. Synapomorphies of Dictyopteran subgroups are determined. The morphological results, the interpretation of many ovipositor sclerotisations and muscles, the assumptions on homology relations, character polarities, and ground-plan morphology, and also the resulting implications on Dictyopteran phylogeny differ greatly from previous workers (e.g. Marks & Lawson, 1962; McKittrick, 1964; Matsuda, 1976).

Kral, K. (1998) Side-to-side head movements to obtain motion depth cues: A short review of research on the praying mantis. *Behavioural Processes*, **43**(1): 71-77.

In the case of a visual field comprised of stationary objects, retinal image motion and motion parallax initiated by the observer can be used to determine the absolute and relative distance of objects. The principle is simple: when the observer moves, the retinal images of objects close to the eye are displaced more quickly-and through a larger angle-than are the retinal images of more distant objects. It is remarkable that not only in humans, but throughout the animal kingdom, from primates down to insects, retinal image motion and motion parallax generated with the aid of head movements is used as a means of distance estimation. In the case of praying mantids, translatory side-to-side movements of the head in a horizontal plane are performed to determine the jump distance to stationary objects. The relevant parameter for determining the distance to the object is the speed of retinal image motion. The motion of the head must, however, also be monitored. This requires a multisensory regulatory circuit. Motion parallax information seems to be mediated by a movement-detecting neuronal mechanism which is sensitive to the speed of horizontal image motion, irrespective of its spatial structure or direction.

Maxwell, M.R. (1998) Seasonal adult sex ratio shift in the praying mantid *Iris oratoria* (Mantodea: Mantidae). *Environmental Entomology*, **27**(2): 318-323.

The adult sex ratio of the praying mantid *Iris oratoria* L. becomes increasingly female-biased as the season progresses. This 3-yr field study examines 3 possible causes of this shift in sex ratio: differences between the sexes in the date of adult eclosion, movement to and from the census area, and adult lifespan. In the field, male and female eclosion dates did not differ significantly. Movement to and from the census area was low for females and males. For each year, the number of females that moved into the area (immigrants) exceeded the number that moved out (emigrants), although this difference was not statistically significant in any year. Fewer males were recaptured; those that were did not show either immigration or emigration. Minimum lifespan for adults in the field was greater for females than males. Female lifespan also was greater among adults maintained in individual field containers. Furthermore, the eclosion dates of these captive adults did not significantly differ between the sexes. Thus, the sexes evidently eclosed at the same time of year, and the females most likely outlived the males in the field. This difference in adult lifespan can lead to an increasingly female-biased sex ratio over the course of the season, with different movement

patterns between the sexes remaining a possible factor.

Maxwell, M.R. (1998) Lifetime mating opportunities and male mating behaviour in sexually cannibalistic praying mantids. *Animal Behaviour*, **55**(4): 1011-1028.

I examined the number of lifetime mating opportunities and mating behaviour of males in two sexually cannibalistic species, the Mediterranean, *Iris oratoria*, and bordered, *Stagmomantis limbata*, praying mantids (Mantodea: Mantidae). Two approaches estimated the number of lifetime mating opportunities: direct observations- of intersexual encounters in the field, and an encounter model. I collected behavioural observations, together with ecological data for use in the model, over three field seasons. The ecological data included an assessment of the feeding condition of *S. limbata* females in nature; the females fed at a level comparable to females maintained on an abundant diet in the laboratory. As for the number of mating opportunities, individual males of both species encountered two or more females, as predicted by the model. I observed no male, however, in more than one copulation. This result could reflect individual variation in the times and places of sexual activity or an actual low number of mating opportunities in the field. Furthermore, a higher percentage of *I. oratoria* males encountered two or more females than *S. limbata* males, as the model indicates. Fewer mating opportunities could lead to greater selection upon *S. limbata* males to ensure paternity at each mating, which can explain the longer copulation times observed for *S. limbata* males. I considered two hypotheses about male behaviour in light of the number of lifetime encounters with females: male suicide and male reduction of the risk of cannibalism. Behavioural observations do not strongly support male suicide in either species. Certain male behaviours, such as the nature of copulatory position and, in captivity, mounting females from the rear, are consistent with the idea that males behave so as to reduce the probability that they are cannibalized during intersexual encounters. Moreover, male *I. oratoria* preferentially mount well-fed, fecund females in captivity. Taken together, these results suggest that the prospect of multiple mating opportunities has influenced male mating behaviour over evolutionary time.

Potester, M. Pabst, M.A. & Kral, K. (1998) Proprioceptive contribution to distance estimation by motion parallax in a praying mantid. *Journal of Experimental Biology*, **201**: 1483-1491.

The behavioural experiments described here examined, in the praying mantis *Tenodera sinensis*, the manner in which the proprioceptive cervical hair plate sensilla are involved in the measurement of the distance to a jump target with the aid of motion parallax actively produced by translatory head motion. Various combinations of surgical deafferentation of the cervical hair plate sensilla had no influence on the linearisation of head motion. However, the measurement of relative and absolute distance and the jump frequency were impaired by these interventions. From the results, it is concluded that the cervical hair plate sensilla are involved in the distance measurement mechanism, probably by allowing the nervous system to compare retinal image motion with head motion.

Oliveira, D. & Oliveira, B. (1998) Notes on the mantid *Sibylla pretiosa* Stål. *Bulletin of the Amateur Entomologists' Society*, **57**(418): 106-111, plates 98E-98H.

This paper gives notes on culturing *Sibylla pretiosa*, data on duration of the different instars, a brief review of the taxonomy and a key to the Sibyllinae. There are four colour and two black-and-white photographs showing nymphs, adults and oothecae.